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AUTHOR Regan, Mary C.; Woelk, Patricia A.
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ABSTRACT

The relationship between characteristics of academic disciplines and intellectual traits of undergraduates was studied. Subject matter areas were structurally reflected in the university as department or major field groupings. A total of 2,278 students, graduating in either 1969-1970 or 1979-1980, were administered the 14 scales of the Omnibus Personality Inventory. Attention was focused on six scales: Thinking Introversion, Theoretical Orientation, Estheticism, Complexity, Autonomy, and Religious Orientation, collectively called the Intellectual Disposition Categories. Assessment was also based on Biglan's comprehensive model of academic subject matter areas, which is based on three dimensions: the existence of a paradigm within a field, the discipline's concern with the applications of knowledge, and concern with life (biology and social science) or with things, ideas, or data (art and mathematics). Statistical findings and narrative explanations and conclusions are provided. Appendices include: categorization of academic disciplines by Biglan's three dimensions (Science-Nonscience, Pure-Applied, Life-Nonlife); and descriptions of the 14 personality scales. (SW)

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UNIVERSITY STRUCTURE AS REFLECTED IN PATTERNS AND PERSISTENCE OF UNDERGRADUATES' CHARACTERISTICS

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By

Mary C. Regan

and

Patricia A. Woelk

Applied Behavioral Science
University of California, Davis
Davis, California

ASHE-AERA Conference
San Francisco, California
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INTRODUCTION

This week the National Institute of Education (NIE) released its report on higher education, Involvement in Learning: Realizing the Potential of American Higher Education. It calls for a reevaluation of the "involvement, expectations, and assessment of students and institutions and seeks to develop strategies to bring both to their full potential. Critical to this endeavor is an understanding of the basis of structure in the university and its relationship to student outcomes. This is the focus of our research.

In higher education both organizational enterprise and member involvement with the institution center in the academic major department. This system is shaped by the socially sanctioned and broadly accepted conception of knowledge as being fragmented into independent spheres, each the domain of a discipline, more or less complete with a history, beliefs, and accepted values and methodologies. On the individual level it is departmental faculty who evaluate student performance, departmental peers with whom one interacts most regularly, and the ideologies and methods of the major field that shape the daily tasks of the learner.

ABSTRACT

This study examines the relationship between characteristics of academic subject matter areas, structurally reflected in the university as department or major field groupings and intellectual, social-emotional, and motivational patterns of two generations of university undergraduates--those who graduated in 1969-70 and those who graduated

in 1979-80 (N=2278). To capture personality the 14 scales of the Omnibus Personality Inventory (OPI) were used. Biglan's (1973) three-dimensional model of subject matter areas was chosen to represent structure. Decade was selected as a fourth explanatory variable with the Biglan dimensions to examine generational patterns of characteristics of students from the late 1960s and the early 1980s. Our sample was comprised of senior men and women who are the unique "output" of a university education. Having successfully completed the requirements of a major field and achieved "fit" within its intellectual and social environments, they also exemplify values and personality orientations of their major fields.

METHODS

Using the Biglan three-dimensional model and Decade as independent variables, a 2 X 2 X 2 X 2 between-subjects multivariate analysis of variance was performed on the 14 dependent OPI variables. The MANOVA was followed by investigating univariate Fs for each of the dependent variables.

Dependent variables were derived from the Omnibus Personality Inventory (OPI) (Heist and Yonge, 1969), an integrated instrument designed to probe values and traits of college students. The 14 scales include measures of student Intellectual orientation, Nonauthoritarian thinking, Socio-Emotional characteristics and Subsidiary measures of altruism, practicality and self-esteem. In this presentation we have chosen to highlight the first six scales, collectively called the IDC, Intellectual Disposition Categories, comprised of Thinking Introversion (TI), Theoretical Orientation (TO), Estheticism (Es), Complexity (Co), Autonomy (Au), and Religious Orientation (RO).

OPI SCALES CHART

The IDC scales are the following:

TI - Thinking Introversion - Exhibits an interest in abstract ideas, theories and reflective thought.

TO - Theoretical Orientation - Critical, logical, analytical thinking--correlates with the scientific method of thinking.

Es - Estheticism - Sensitivity to phenomena, esthetic perspective, and the feeling component of personality.

Co - Complexity - Reflects a flexible, experimental attitude toward experience, is tolerant of ambiguities and uncertainty, open to contradictory ideas, diverse types of people.

Au - Autonomy - Liberal, nonauthoritarian thinking, the need for independence, the ability to act and think independently of traditional authority.

RO - Religious Orientation - High scores equal religious liberalism, Low scores relate to conservative religious beliefs.

BIGLAN MODEL BOX

Independent variables were developed from the three dimensions of Biglan's comprehensive model of academic subject matter areas, based on faculty assessments of differences among fields. The model reflects the horizontal differentiation within the individual university or college, the primary division by fields of knowledge. The model also

reflects the division into colleges, schools or faculties (such as Engineering, L&S or Agriculture) with distinct orientations to subject matter.

The three dimensions are based on a) existence of a paradigm within a field (HARD-SOFT), b) concern with the applications of knowledge (PURE- APPLIED), and c) concern with life or organic systems.

Dimension I HARD-SOFT is based ont he existence of a recognized paradigm within a field. Science epitomizes a high-paradigm category of fields. Others exist, however, including Engineering which strictly speaking deals with technology, the application of scientific knowledge, and the "problem-focused" agricultural sciences. These form the Hard category while Social Sciences and Humanities form the Soft.

The second Biglan dimension, APPLIED-PURE, reflects another powerful bipolar dimension of academia, the concern or lack of it with applications of knowledge. This dichotomy separates "pure science" from technology-oriented fields, pure biological sciences from applied (agricultural) sciences, and pure humanities (such as fine arts) from applied (design and architecture.

Dimension 3, LIFE-NONLIFE is the most subtle of the three dimensions as it is least related to the cognitive function of the university. It differentiates groups interested in people or organic systems (biological and social sciences) from groups concerned with "things, ideas or data" (engineering, art, mathematics).

In this study DECADE functions as an independent variable as well as an indicator of persistence. Generational membership is another formative force on values and personal identity. Not only do generational cohorts share common experiences during formative periods, they also perceive themselves as being substantively different from any

other generational group (Levine, 1981). The two generations examined in this study, students of the late sixties and from the early eighties, are widely perceived as being polarized from one another.

HARD-SOFT OPI CHART

On the Hard-Soft dimension 12 of the 14 OPI dependent variables were significant.

Soft area students exhibited a greater interest in abstract ideas and reflective thought (TI) and were more tolerant of ambiguity (Co). They were also more autonomous (Au) and nonauthoritarian in their approach to learning.

Hard area students were more critical, analytical, and logical (TO) in their approach to problems. They see the world rationally rather than from a feeling or sensitivity perspective. They tend to be more focused and less open to contradictions and ambiguities (lower Au and Co than Soft.)

Individuals in the Hard dimension were also more socially extroverted (SE), more impulsive (IE), less anxious (AL), more practical (PO), less altruistic (Am) and more self-confident than individuals in the Soft dimension.

APPLIED-PURE OPI CHART

On the Applied-Pure dimension 9 of the 14 OPI variables were significant.

Applied majors were less reflective than Pure majors, preferring to evaluate ideas on t he basis of practical, immediate application (lower TI). They were less responsive to esthetic stimuli and tended to have a fixed way of organizing phenomena (lower Co). They also were less intellectually independent than Pure majors.

Applied majors were also more outgoing and social (SE) than Pure majors as well as more practical (PO) and more self-confident (RB).

LIFE-NONLIFE OPI CHART

On the Life-Nonlife dimension 5 of the 14 scales were significant.

Nonlife majors were more sensitive and esthetic majors. The Life majors tended to be well adjusted (PI) and somewhat more self-confident than Nonlife majors.

The Life-Nonlife was more potent in interaction with Hard-Soft areas than as a separate influence.

DECADE 1 and 2 C HART

Students graduating in 1980 were more interested in theoretical abstract ideas and reflective thought (TI) than in 1970. They were less experimental and tolerant of diversity (Co), less intellectually

liberal (Au), less questionaing of intellectual authority and more conventioanl in religious orientation (RO) than were students in 1970.

Students of the 1980s are also more socially extorverted (SE), are less alienated and more affiliative and trusting. They value material possessions and concrete accomplishments and are more self-confident than the students who graduate in 1969-70.

THE BIG FOUR ACADEMIC AREAS

Interactions of the three Biglan dimensions form subject matter area groupings that display patterns of intellectual orientation so different as to be described as "different worlds." Consider the first four variables TI, TO, Es and Co in particular:

PHYSICAL SCIENCES CHART

The PHYSICAL SCIENCES, for example, are characterized by a high TO (Theoretical Orientation) and low Es (Estheticism).

HUMANITIES CHART

While the HUMANITIES at the opposite extreme are low on TO but high on Es.

BIOLOGICAL SCIENCES CHART

The BIOLOGICAL SCIENCES are a less extreme version of the "scientific" profile than the Physical Sciences. They are somewhat lower on TO but higher on Es than the Physical Sciences.

SOCIAL SCIENCES CHART

The SOCIAL SCIENCES higher TI than the sciences, a higher TO than Humanities and Es and Co above the mean. The Biological and Social Sciences represent two university subcultures that personality-wise are not "worlds apart."

INTERACTIONS: THE MODEL UNFOLDED

BIGLAN BOX CHART HERE

On the most detailed level created by three-way interactions of the Hard-Soft, Applied-Pure and Life-Nonlife dimensions one may observe these polarized patterns of intellectual orientation. They may also be seen repeated within academic groups generation after generation, attesting to the power of these separate cultures to select and shape students.

Pure Biological Sciences Chart

The Pure Biological Sciences have the "generic science profile", highest on TO. The pattern is retained over the decade. There is, however, a noticeable drop in Independence (Co, Au, RO) scores.

Pure Physical Sciences Chart

Pure Physical Sciences are more extreme science profile. The pattern is repeated over the decade this time at a somewhat higher level, perhaps reflecting the tighter selection standards exercised by the Physcial Sciences. While Co has not dropped over the decade, again both Au and RO have.

Engineering Chart

Engineering is the "applied" physical sciences group. As with other Applied groups, the overall intellectual profile is lower than Pure counterparts. The pattern remains virtually congruent with a slight increase in TI, Es and a drop on TO.

Pure Humanities Chart

Not only Hard or Scientific areas show congruence of intellectual profiles over the decade, Humanities and Social Sciences do too. Pure Humanities shows no change over the decade on the TI, TO, and Es. Like other groups, though, there is a drop on Independence scores, Co, Au and RO.

Pure Social Sciences

The Pure Social Sciences show similar profiles over the decade with a slight drop on TI. Like others, drops on Au and RO. The biggest downturn was on Complexity which was the highest trait of the first four "discipline-driven" variables in Decade 1.

What we have observed is a surprising pattern of intellectual stability within academic majors from one generation to another.as well as a serious trend toward diminished Independence across groups in the 1980s students. If stability of personality is the rule, is there an exception, areas in which change can and does occur in patterns of membership?

Applied Biological Sciences

Applied fields (with the exception of Engineering) demonstrated change rather than stability over the decade. The new student is more inclined to theory and ideas (higher TI), more sensitive and intuitive (Es) in approaching problems. Contrary to most of their generation, they are also higher on Complexity--a new type of student.

Applied Social Sciences

The new student in Applied Social Sciences is far different from the traditional student. They are high on TI, Es and in general a different style of intellectual orientation than a generation earlier.

What may be said of the generational effect we have observed on independence scores (lowered Co, Au, RO in the 1980s),an effect so powerful that it cuts across academic groups? Is the drop merely an artifact of a lower level of student inputs or does it too relate to the university environment? Freshman to senior scores for men and women for the decades tell the story. On Complexity, for instance, in 1970 students came in lower as freshmen (Mean score for men was 54 on entrance as opposed to 55 in 1980; women 53 as opposed to 56). By graduation, however, 1970s students had made a large developmental leap (Men went from 54 to 62, women from 49 to 54) while 1980s students had changed by only a single point. Something in the university environment had changed and this acted against this important area of personal growth.

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SUMMARY

These data bring us to several conclusions:

First, university structure does have an effect on personalities of students. Particularly, the stamp of the major field is left on their intellectual functioning.

Second, these patterns persist over widely separated groups of members who are themselves quite different from one another. This indicates the level to which these personality patterns are institutionalized in the university. For change to occur--toward a more well-rounded intellectual style--it will take changes of seismic proportions to alter the existing order.

Third, student development needs to again become a concern to faculty and administrators as evidenced by diminished Independence scores--a definite red flag when one considers that these are to morrow's leaders who are the inheritors of a more not less diverse world.

Fourth, as attention is refocused on the teaching function an understanding of the diversity of learning styles that emanate from these academic "worlds apart" appears critical.

Finally, again it is incumbent on faculty who are those who select and socialize students to be aware that it is their collective definitions of the situation, their beliefs which are transmitted more directly than any other influence. If change for the institution is deemed desirable, it begins in the individual.

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	MALE		FEMALE	
	1980	1970	1980	1970
THINKING INTROVERSION				
Freshman	48	47	48	50
Sophomore	51	48	51	50
Junior	51	50	52	50
Senior	51	50	53	51
THEORETICAL ORIENTATION				
Freshman	52	53	47	47
Sophomore	51	52	49	48
Junior	55	53	50	49
Senior	54	54	51	49
ESTHETICISM				
Freshman	48	45	52	52
Sophomore	49	48	53	54
Junior	49	47	53	53
Senior	50	49	53	54
COMPLEXITY				
Freshman	52	50	50	49
Sophomore	52	52	51	52
Junior	53	53	51	52
Senior	53	55	51	54
AUTONOMY				
Freshman	55	54	56	53
Sophomore	58	60	58	60
Junior	57	62	59	62
Senior	57	62	59	62
RELIGIOUS ORIENTATION				
Freshman	55	55	53	52
Sophomore	57	58	54	56
Junior	57	57	55	56
Senior	55	60	55	58

BIGLAN DIMENSIONS

HARD-SOFT APPLIED-PURE LIFE-NONLIFE

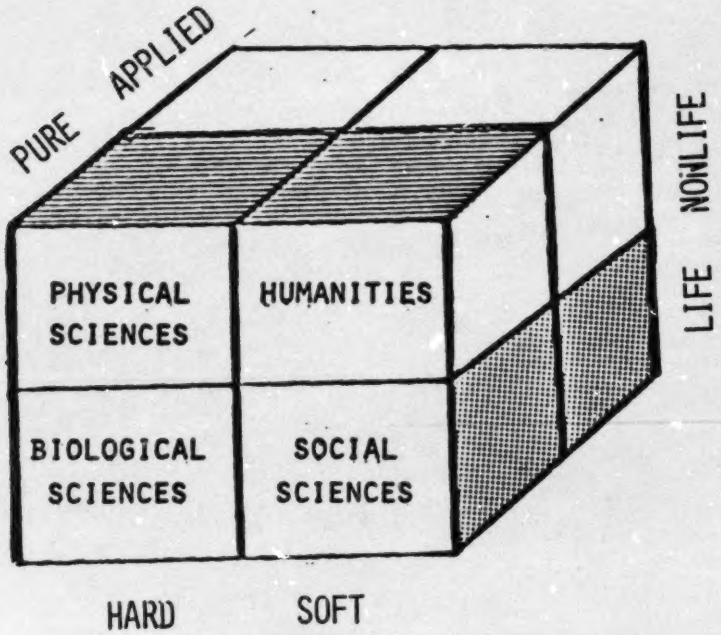

Figure 1

Table 1.
Clustering of Academic Task Areas in Three Dimensions

Task Area	Hard		Soft	
	Nonlife System	Life System	Nonlife System	Life System
Pure	Astronomy Chemistry Geology Math Physics	Botany Entomology Microbiology Physiology Zoology	English German History Philosophy Russian Communications	Anthropology Political Science Psychology Sociology
Applied	Ceramic Engineering Civil Engineering Computer Science Mechanical Engineering	Agronomy Dairy Science Horticulture Agricultural Economics	Accounting Finance Economics	Educational Administration & Supervision Secondary & Continuing Education Special Education Vocational and Technical Education

Note: From "Relationships Between Subject Matter Characteristics and the Structure and Output of University Departments" by Anthony Biglan, *Journal of Applied Psychology*, 1973, 57, 204-213. Copyright 1973 by the American Psychological Association.

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FOOTNOTES

[1]In The Higher Education System (1983) Clark gives a detailed definition of higher education structure including its relationship to the disciplines.

> "The discipline and the enterprise together determine academic organization in a special way. To the extent that systems concentrate on their knowledge tasks, the most important single fact about their operations is that the discipline and the enterprise model of linkage converge in the basic operating units, the primary working groups of the academic world. The department or the chair or the institute is simultaneously a part of the discipline and a part of the enterprise, melding the two and drawing strength from the combination....As academic parts import the disciplinary connectrion, their centrality is enormously enhanced and even made qualitatively different from that found in nearly all other parts of society....The arguement can be summarized in three parts: (1) The core membership unit in academic systems is discipline-centered. (2) Each disciplinary unit within the enterprise has self-evident and acclaimed primary in a front-line task. (3) The characteristics of core membership groups affect everything else of importance in the organization. (Clark, 1983: 32-34)

The division of the academic enterprise are also well-defined and give us a vocabulary for referring to units of structure:

> Within institutions, we refer to the horizontally aligned units as sections; the vertical arrangements tiers. Among institutions, the lateral separations are called sectors; the vertical hierarchies-....Horizontal differentiation within the individual university or college is the primary form of division by fields of knowledge. Such division has occured typically at two levels of faculty, school, and college....The narrower groups, which are the basic guiding blocks or operating units (are) known generally as chair, institute, or department. (Clark, 1983: 36-37).

[2]Creswell and Roskens (1981) summarize the Biglan studies. Their explanation of the model and its derivation is concise for our purposes:

> The Biglan model consists of categorizing thirty-five academic departments into the hard or soft, pure or applied,. life or nonlife areas, and then arranging the areas into a 2X2X2 table with eight categories. (See Figure 1 and Appendix I for expanded categories used in our study)....Biglan developed the model during a 1971 project coordinated by Fred Fiedler examining university departments (Biglan, Oncken, & Fiedler, 1971). He began by examining the characteristics of academic tasks in departments since he recognized that leadership effectiveness in Fiedler's (1964) contingency model is partially based on task structure. He also assumed that each academic area (e.g. physics, English) contained a different set of problems and methods that constituted the tasks of the area. To test this assumption, Biglan asked faculty at the University of Illinois and at one small liberal arts college in the State of Washington to categorize thirty-five academic departments into groups based on similar characteristics of the subject matter of each area (Biglan, 1973a). Using Kruskal's (1964) techniques for nonmetric multidimensional scaling, Biglan derived three dimensions of academic areas: the extent to which the areas had a well-defined paradigm structure, hard-soft; the extent to which the areas had a well-defined the areas had an orientation to application, pure-applied; and the extent to which the areas were oriented to living organisms, life-nonlife. Biglan then clustered the thirty-five departments into each of the three dimensions resulting in a eight-category classification.

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DESCRIPTION OF THE SCALES

INTELLECTUAL

(TI) Thinking Introversion - Demonstrates a liking for reflective thought, expresses interests in a broad range of ideas found in a variety of arenas. Thinking less dominated by immediate conditions and situations.

(TO) Theoretical Orientation - Indicates a preference for dealing with theoretical concerns and problems using the scientific method of thinking. More restricted range of ideas than TI. Generally logical, analytical, and critical in their approach.

(ES) Estheticism - High level of sensitivity to stimuli, especially the esthetic, and the environment.

(CO) Complexity - Reflects a flexible, experimental orientation rather than a fixed way of viewing and organizing phenomena. Tolerant of ambiguities and uncertainties.

NONAUTHORITARIAN

(AU) Autonomy - Characterized by liberal, nonauthoritarian thinking and a need for independence. Tolerant of alternative viewpoints, independent of traditional authority.

(RO) Religious Orientation - High scorers are skeptical of conventional religious beliefs and practices, particularly the orthodox and fundamental. Low scorers tend to manifest a strong commitment to Judaic-Christian beliefs and to be conservative in general, frequently rejecting other viewpoints.

SOCIAL-EMOTIONAL

(SE) Social Extroversion - Displays a strong interest in being with people, seek social activity and gain satisfaction from it.

(IE) Impulse Expression - Tends to have an active imagination, value sensual reactions and feelings, displays a general readiness to express impulses and seek gratification through overt action or conscious thought.

(PI) Personal Integration - Admits to few attitudes and behaviors that characterize personal reflection. Low scorers admit to feelings of isolation, rejection, loneliness or agression.

(AL) Anxiety Level - High scorers admit to few feelings of anxiety and do not admit to being nervous or worried. Low scorers indicate the opposite. (NOTE: A high score indicates low level of anxiety.)

MOTIVATIONAL

(AM) Altruism - Strong concern for feelings of others. Affiliative and trusting in relations with others.

(PO) Practical Outlook - Interested in practical, applied activities. Immediate utility is criterion most often used to evaluate ideas and experiences.

(MF) Masculinity-Femininity - High scorers (masculine) deny interests in esthetic matters, admit to few adjustment problems, feelings of inadequacy. Tend to be less socially inclined than low scorers (Feminine) and more interested in scientific matters.

(RB) Response Bias - Originally used to assess student's test-taking attitude. Later found to correlate with self-esteem measures of OPI.

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TABLE 1

TABLE 2. DECADE BY HARD-SOFT BY LIFE-NONLIFE BY PURE-APPLIED MAJOR DIFFERENCES IN OPI SCORES: MANOVA AND ANOVA F-VALUES

		Univariate F's													
		Intellectual				Non-Authoritarian		Social-Emotional				Subsidiary			
Source	Multivariate Approximate F	TI	TO	Es	Co	Au	RO	SE	IE	PI	AL	Ao	PO	MF	Ag
A. Decade	38.86****	7.09**	1.96	0.00	21.58****	169.07****	81.55****	27.73****	6.00*	7.84***	0.07	18.38****	18.47****	5.83*	288.85****
B. Hard-Soft	73.44****	151.77****	161.73****	301.75****	38.22****	41.08****	0.29	43.04****	20.32****	2.33	24.13****	103.33****	65.14****	534.60****	178.43****
C. Life-Nonlife	4.89****	2.12	0.18	19.28****	0.51	0.59	4.01*	0.00	0.01	8.06***	1.86	3.16	0.17	11.33****	4.87*
D. Pure-Applied	7.59****	39.35****	41.83****	28.16****	11.34****	29.36****	0.53	12.47****	2.49	0.22	0.22	3.85*	33.65****	2.72	9.88***
A x B	3.49****	3.60	5.10	6.66**	10.02***	8.16***	1.82	0.43	0.08	0.05	0.02	5.70*	7.39**	16.40****	5.53*
A x C	2.20**	1.34*	4.71	3.56	0.09	2.59	3.49	0.41	3.69	0.51	0.58	6.03**	2.98	10.60****	0.02
A x D	2.30***	2.54	0.15	5.14*	8.19***	9.77***	0.27	1.01	3.31	6.[illegible]	4.98*	1.24	8.46***	14.51****	5.45*
B x C	16.62****	4.74*	45.93****	59.89****	3.08	6.11*	5.39*	0.00	5.86*	1.18	4.64*	7.16*	0.00	1[illegible].****	8.99***
B x D	1.34	0.12**	6.44	0.58	0.37	0.31	0.05	0.11	0.82	1.76	0.08	0.05	0.76	0.69	2.58
C x D	2.83****	0.06	1.55	3.37	3.53	0.38	8.42***	0.19	3.66	0.14	1.26	0.34	0.28	5.80*	0.02
A x B x C	1.60	3.16	0.68	0.05	0.24	3.64	2.22	2.58	0.02	1.67	0.22	0.67	0.97	1.35	2.57
A x B x D	< 1	0.11	0.06	0.09	0.26	0.62	0.15	3.31	0.81	6.02	1.63	3.20	0.78	0.03	5.92
A x C x D	2.68****	3.54	7.87***	3.65	6.19**	13.01****	0.02	0.10	0.70	0.43	0.29	3.88*	20.36****	1.32	0.68
B x C x D	2.48**	1.48	1.86	11.60****	1.05	0.20	0.00	0.10	3.13	1.34	1.04	1.29	0.15	12.36****	2.80
A x B x C x D	< 1	0.59	2.39	0.43	0.00	0.33	0.00	0.24	0.06	0.28	0.07	0.33	0.08	2.23	0.68

Note: Df. always 14,2260
< 1 = Less than 1

* $p < .05$ ** $p < .01$ *** $p < .005$ **** $p < .001$

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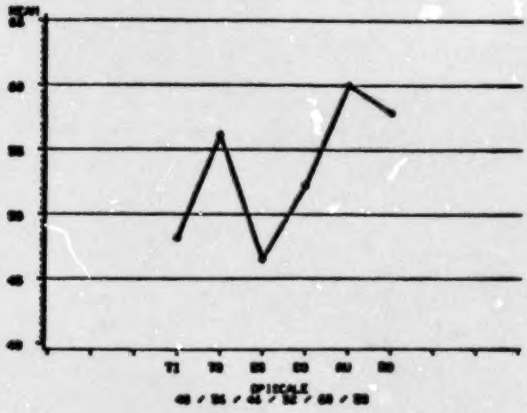
TABLE 2

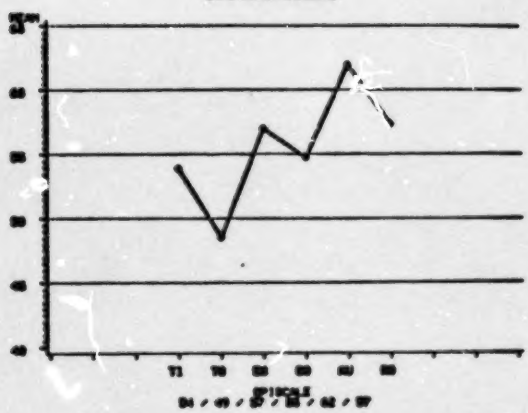
TABLE 3. [illegible] MEANS: HARD-SOFT, LIFE-NONLIFE, PURE-APPLIED, DECADE BREAKDOWN

Source	N	Intellectual				Non-Authoritarian		Social-Emotional				Subsidiary			
		TI	TO	Es	Co	Au	RO	SE	IE	PI	AL	Au	PO	NF	RB
HARD															
Life															
Applied															
1970	181	46.3	50.9	46.7	49.7	58.6	57.9	45.7	52.6	56.1	53.8	49.3	46.2	52.9	50.2
1980	153	50.4	51.1	50.8	52.4	58.6	54.9	47.1	52.9	55.0	51.9	53.8	43.6	48.3	52.9
Pure															
1970	271	49.7	56.4	49.0	53.9	61.7	59.1	43.0	53.0	54.9	53.7	50.3	42.5	53.9	51.4
1980	98	51.5	55.0	50.0	51.1	58.1	56.4	47.3	49.9	58.8	55.2	54.3	43.9	52.1	58.3
Nonlife															
Applied															
1970	128	46.4	56.8	44.7	51.7	60.6	58.6	45.6	54.2	55.3	54.9	47.9	44.6	59.6	58.9
1980	75	49.5	54.2	47.7	52.1	56.1	56.0	47.9	54.6	54.9	53.7	50.2	46.2	53.8	54.7
Pure															
1970	91	47.6	56.5	46.7	52.7	62.1	58.1	42.2	53.2	53.9	53.1	47.6	41.4	56.1	58.9
1980	30	53.4	61.5	49.9	54.1	60.0	55.1	47.4	52.8	57.8	54.5	52.8	40.8	52.9	58.5
SOFT															
Life															
Applied															
1970	84	49.5	49.1	48.0	53.0	61.0	58.9	47.9	54.4	56.5	52.8	52.2	43.8	58.9	47.2
1980	66	53.4	49.8	52.5	52.9	59.2	54.1	51.3	54.2	57.2	51.3	57.8	42.1	45.4	53.3
Pure															
1970	425	52.5	50.9	53.2	56.8	63.6	59.9	46.6	56.1	54.9	52.6	53.9	40.8	48.4	47.2
1980	68	54.4	51.5	53.7	52.6	57.8	54.7	49.6	54.6	56.2	52.3	54.5	44.0	47.9	54.1
Nonlife															
Applied															
1970	29	49.9	46.6	50.8	57.2	60.7	59.3	47.5	57.7	52.5	50.7	52.6	42.2	42.8	42.7
1980	17	50.7	46.4	57.9	50.9	56.1	56.6	50.9	56.8	54.6	51.2	51.8	46.4	43.2	51.1
Pure															
1970	478	54.1	48.6	56.8	56.3	62.8	57.7	47.1	54.2	54.0	51.3	54.6	40.6	43.5	46.1
1980	69	54.6	49.8	56.9	51.3	58.4	54.7	47.7	53.5	53.5	50.8	55.0	42.7	43.6	51.2
TOTAL	2278														

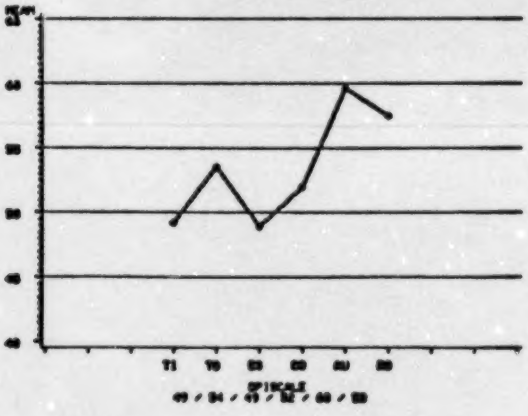
PHYSICAL SCIENCES



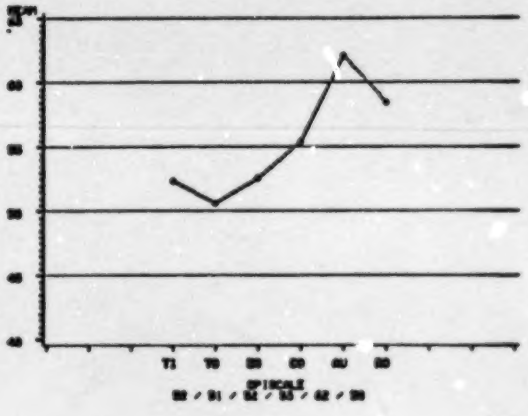
HUMANITIES



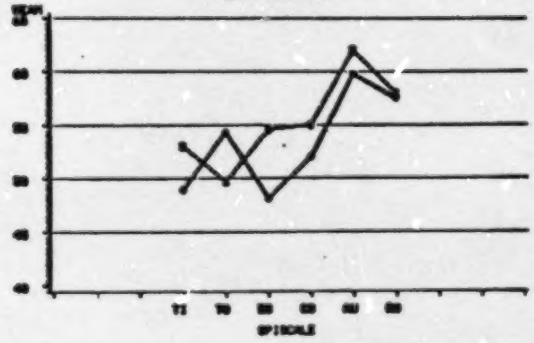
BIOLOGICAL SCIENCES



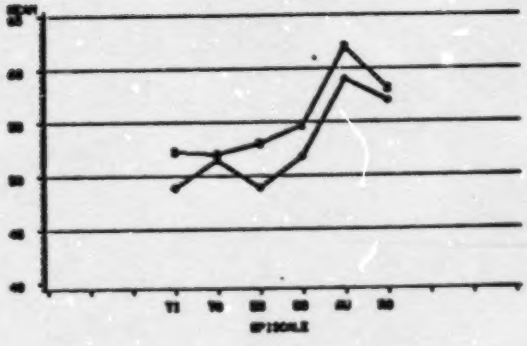
SOCIAL SCIENCES



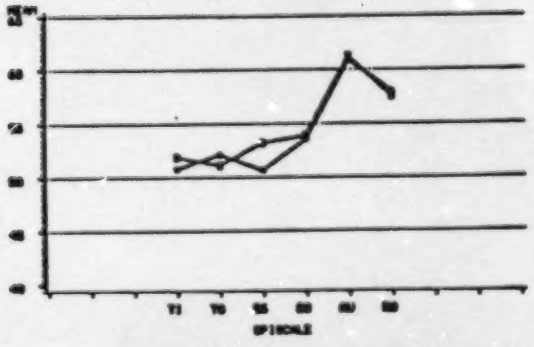
HARD vs. SOFT



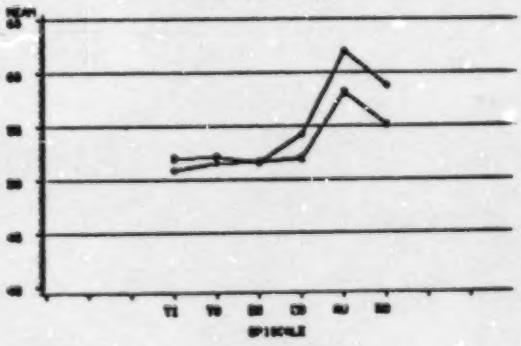
APPLIED vs. PURE



LIFE vs. NONLIFE



DECADE 1 vs. DECADE 2



ACADEMIC SUBJECT MATTER AREAS

CATEGORIZED BY THE BIGLAN DIMENSIONS

Science-Nonscience, Life-Nonlife, Pure-Applied

HARD-LIFE-PURE

048 Anatomy
108 Bacteriology
111 Biochemistry
120 Biological Sciences
126 Bio Physics
138 Botany
195 Comparative Pathology
270 Endocrinology
390 Genetics
570 Microbiology
675 Physiology
933 Zoology

HARD-LIFE-APPLIED

017 Agrarian Studies
021 Agricultural Chemistry
022 Ag and Environmental Chemistry
033 Ag Genetics
039 Ag Science and Management
042 Agronomy
055 Animal Behavior
060 Animal Science
105 Atmospheric Science
107 Avian Science
185 Community Nutrition
198 Comparative Pharmacology and Toxicology
203 Consumer Food Science
205 Consumer Science
206 Crop Protection
225 Dietetics
233 Earth Science and Resources
243 Ecology
248 Entomology
352 Environmental Policy Analysis and Planning
353 Environ. Toxicology
355 Environ. Planning and Management
361 Family Nurse Practioner
362 Fermentation Science
373 Food Biochemistry
375 Food Science
438 Home Ec
441 Horticulture
447 Immunology
465 IAD
471 Irrigation
558 Medicine (MD, DDS, Optometry, Public Health)
600 Nursing
603 Nutrition
606 Nutrition Science
610 Oceanography (Marine Biology)
646 Pharmacology & Toxicology
654 Physical Education
681 Plant Pathology
684 Plant Physiology
681 Plan Protect. & Pest Management
690 Plant Science.
732 Preforestry
771 Preventive Vet. Medicine
773 Primary Health Care
798 Range Management
799 Range Science
800 Range & Wildlife Science
804 Renewable Natural Resources
873 Soil & Water Science
876 Soil Science
899 Textiles
900 Textile Science
914 Textiles & Clothes
915 Vegetable Crops
918 Veterinary Medicine
926 Water Science
927 Wildlife & Fisheries Biology

HARD-NONLIFE-PURE

153	Chemistry
402	Geology
540	Mathematics
657	Physical Sciences
666	Physics
891	Statistics

HARD-NONLIFE-APPLIED

029	Agricultural Engineering Forest Option
073	Applied Physics
078	Engineering - Applied Sciences
197	Computer Science
273	Engineering
274	Engineering - Lower Division
281	Aeronautical Engineering
285	Agric. Engineering
286	Agric Engin/Materials Science and Engineering
289	Engineering - Biomedical
294	Chemical Engineering
297	Chemical Engineering/-Materials Science and Engineering
300	Civil Engineering
301	Civil Engineering/Materials Science and Engineering
303	Electrical Engineering
307	Electricxal Engineering/-Materials Science and Engineering
320	Individual Engineering
326	Electrical Engin - Computers
327	Materials Science and Engineering
329	Electrical Engineering - Electrons, Ckt, Sig Processing
330	Mechanical Engineering
331	Mechanical Engineering/-Materials Science and Engineering
332	Mechanical Engineering/-Aeronautical Engineering
382	Electrical & Computer Engineering
897	Solar Design

SOFT-LIFE-PURE

063	Anthropology
246	Economics
396	Geography
510	Linguistics
699	Political Science
780	Psychology
867	Sociology
871	Sociology-Criminal Justice
872	Sociology-Social Welfare

SOFT-LIFE-APPLIED

012	Administration (private, public, human resource management)
018	Agricultural Business Management
024	Agricultural Economics
025	Agricultural Economics and Business Management
026	Agricultural and Managerial Economics
027	Agricultural Education
070	Applied Behavioral Science
159	Child Development
176	Clinical Psychology (Sexology)
182	Community Development
210	Counseling
224	Development, Resource and Consumer Economics
241	East Asian Studies
376	Food Service Management
445	Human Development
468	International Relations
501	Law
539	Mass Communication
566	Mexican-American (Chicano) Studies
587	Native American Studies
700	Political Science (Public Service)

SOFT-NONLIFE-PURE

014	African-American Studies
045	American Studies
090	Art
091	Art Studio
093	Art History
169	Classical Civilization
174	Classics
192	Comparative Literature
215	Dance
234	Dramatic Art
344	English Linguistics
345	English
346	English Teaching
347	English Writing
387	French
408	German
414	Greek
429	History
430	History of Art
444	Humanities
561	Medevil Studies
579	Music
621	Oriental Languages
651	Philosophy
801	Religious Studies
807	Rhetoric
819	Russian
822	Russian Literature & History
882	Spanish

SOFT-NONLIFE APPLIED

222	Design
506	Library Science